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A PHENOMENOLOGICAL APPROACH TO SIMULATING THE EVOLUTION OF RADIOACTIVE-WASTE CONTAINER DAMAGE DUE TO PITTING CORROSION†

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The damage to high-level radioactive-waste containers by pitting corrosion is an important repository design consideration. It is desirable to calculate the evolution of the pit depth *distribution*, not just the time required for initial penetration of the containers, so that the area available for advective or diffusive release of radionuclides through the container can be estimated. A phenomenological approach for computing the time evolution of these distributions is presented which combines elements of the deterministic and stochastic aspects of pit growth. The consistency of this approach with the mechanisms believed to control the evolution of the pit depth distribution is discussed. Qualitative comparisons of the preliminary results with a variety of experimental data from the literature are shown to be generally favorable. The sensitivity of the simulated distributions to changes in the input parameters is discussed. Finally, the results of the current model are compared with those of existing approaches based on extreme value statistics, particularly regarding the extrapolation of laboratory data to long times and large surface areas.

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